

TAIYO YUDEN

High Reliability Products for

**Automotive**

TAIYO YUDEN CO., LTD.

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104-0031, Japan

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on the left for proposed solutions to High Reliability Products.

[https://www.yuden.co.jp/or/solutions/high\\_reliability\\_auto/index.html](https://www.yuden.co.jp/or/solutions/high_reliability_auto/index.html)

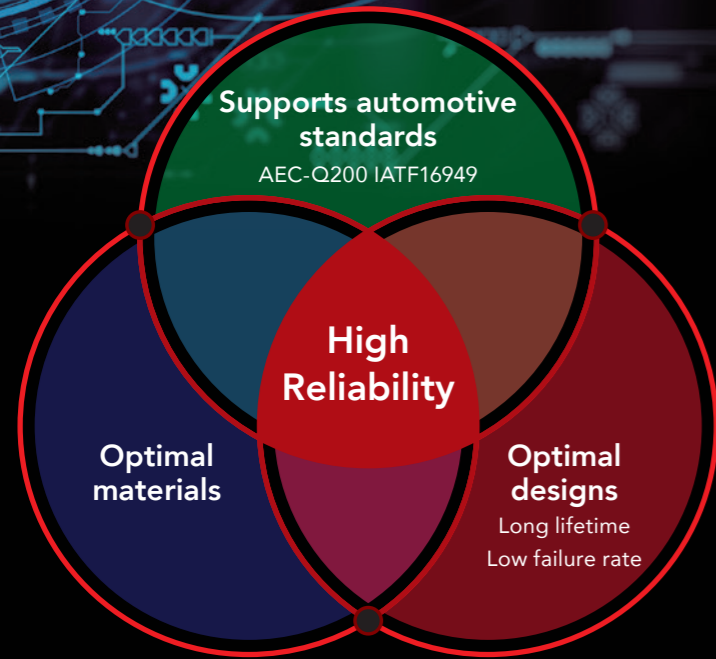


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What's the difference?

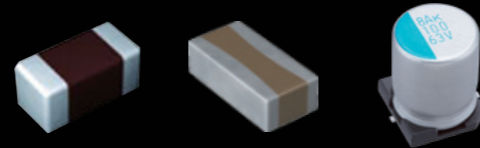
# High Reliability Products



Products optimized for the requirements of individual market, such as automotive device and industrial equipment markets

## Capacitors

Multilayer Ceramic Capacitors/Conductive Polymer  
Hybrid Aluminum Electrolytic Capacitors



## Inductor and EMC Suppression Components

Metal Power Inductors/Ferrite Power Inductors  
Ferrite Bead Inductors



## Powertrain/Safety

### Powertrain

engine ECU  
cruise control unit  
4WS (4 wheel steering)  
automatic transmission  
power steering  
HEV/PHV/EV core control  
(battery,inverter,DC-DC)  
automotive locator  
(car location information providing device)

## Body & Chassis/Infotainment

### Body & Chassis

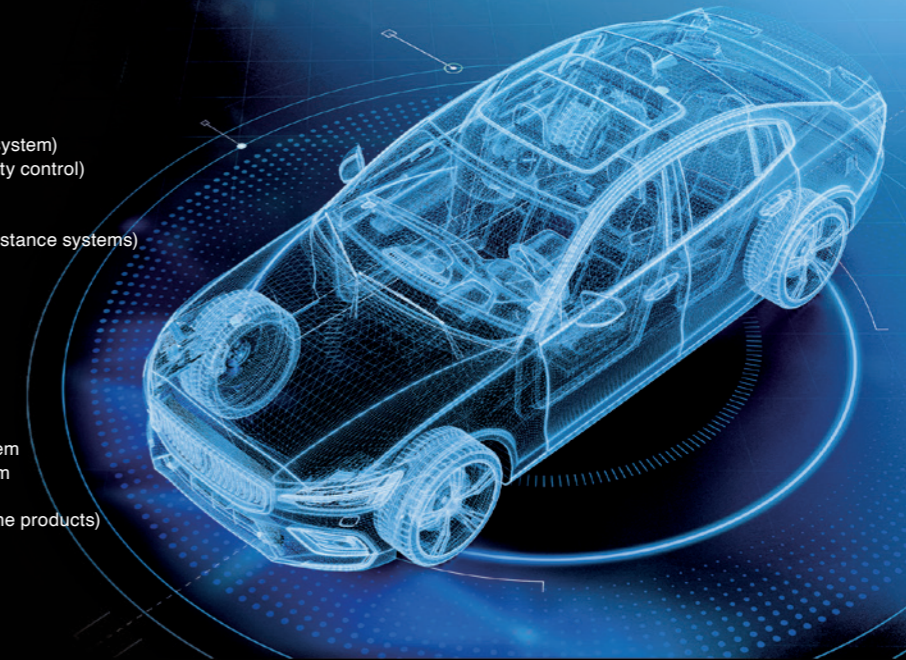
wiper  
automatic door  
power window  
keyless entry system  
automobile digital mirror  
interior lighting  
air conditioning system  
TPMS(tire pressure monitoring system)  
anti-theft device (immobilizer)  
ADAS (sensor, equipment that is not interlocked with safety equipment or powertrain)

### Safety

ABS(anti-lock brake system)  
ESC(electronic stability control)  
airbag  
ADAS  
(advanced driver-assistance systems)

### Infotainment

car infotainment system  
ITS /telematics system  
instrument cluster  
drive recorder (genuine products)



## About Regulation

### AEC-Q200

- AEC-Q100: integrated circuits (IC)
- AEC-Q101: discrete semiconductor components (transistors, diodes, etc.)
- AEC-Q200: passive components (capacitors, inductors, etc.)

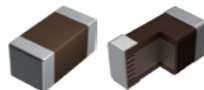
### AEC-Q200 features

Establishes standards for high reliability, including high temperature/high humidity resistance, thermal shock resistance, and durability.

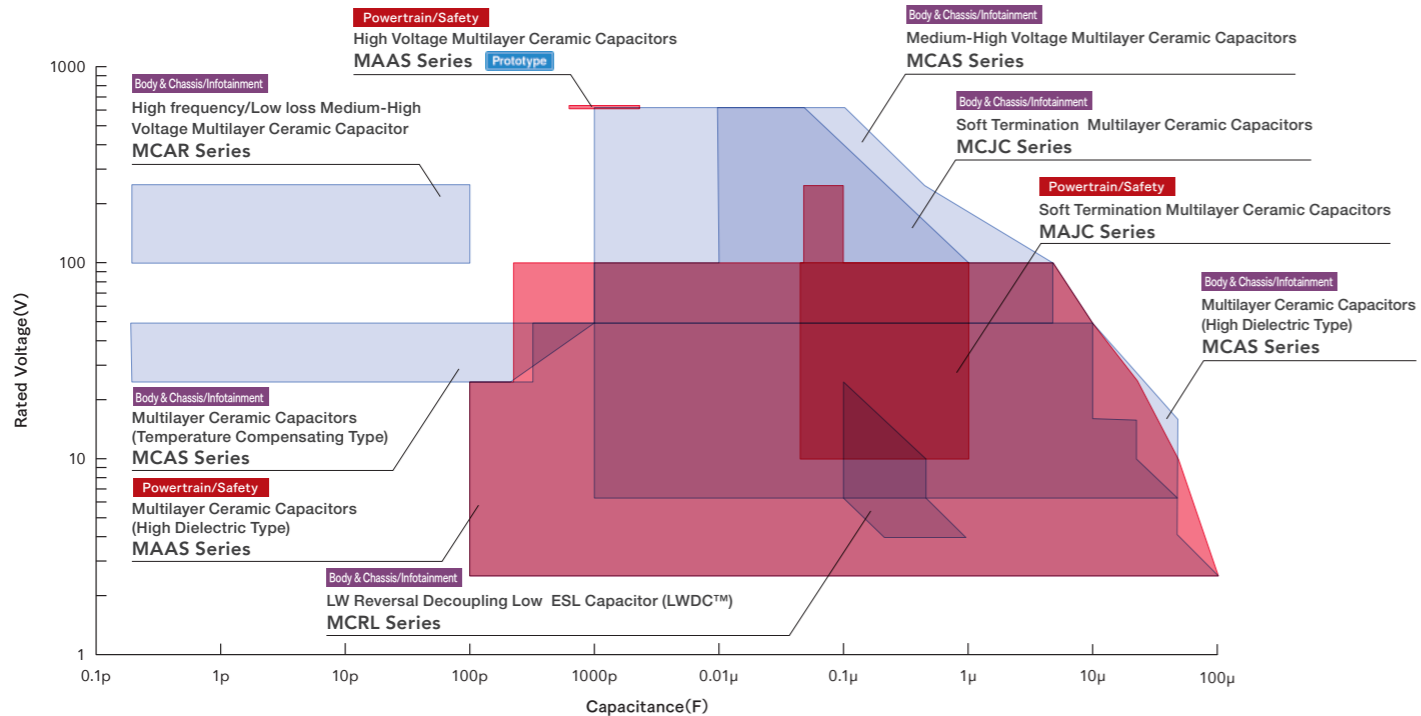
### IATF16949(management system standard for the automobile industry)

IATF16949 is a quality management system standard for the automobile industry issued by the IATF (International Automotive Task Force). TAIYO YUDEN plants have received IATF16949 certification not only in Japan, but also in South Korea, China, Philippines, and Malaysia. These plants manufacture a broad range of High Reliability Products. The multipolarization (decentralization) of manufacturing sites minimizes the risk of impact of natural disasters and international conflicts; and utilizes the geographical advantage of being close to customers (consumption area) to establish SCM (supply system) which can deliver products more quickly.

# Multilayer Ceramic Capacitors



Performance map



※ "LWDC" is a registered trademark or a trademark of TAIYO YUDEN CO., LTD. in Japan and other countries.  
※ The characters before "Series" are extracted from the product number and used for representing the classification (e.g., type, characteristics) of the product.

# Featured Products

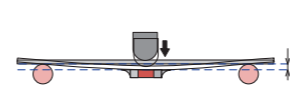
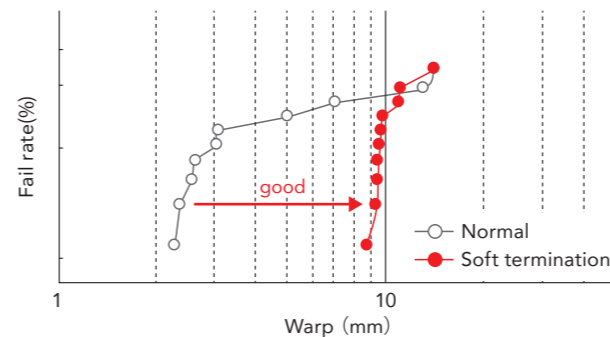
Powertrain/Safety Body & Chassis/Infotainment

## Soft Termination Multilayer Ceramic Capacitors

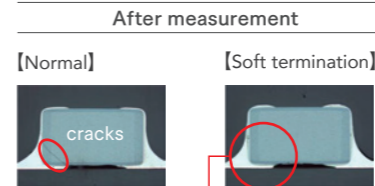


Use of a conductive resin for the external electrodes  
 • Inhibits cracking due to printed circuit board deflection stress  
 • Inhibits solder fatigue due to thermal shock

### Inhibits cracking due to printed circuit board deflection stress

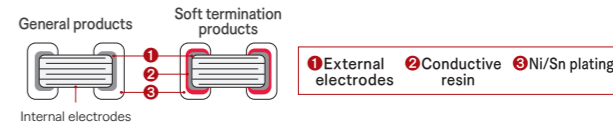


Measurement of the amount of deflection when a crack is formed

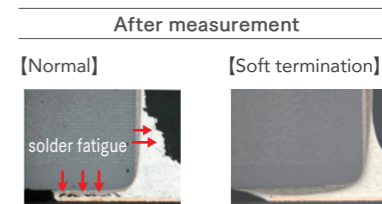
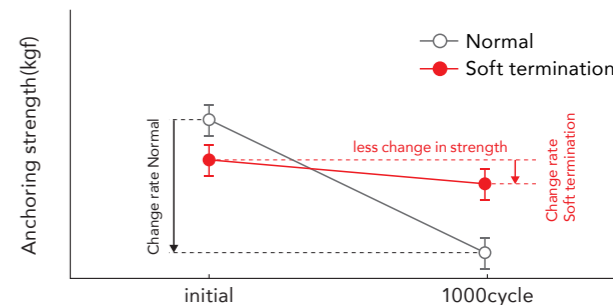


The resin layer alleviates the stress to suppress the occurrence of cracks

## Structures of general products and soft termination capacitors



### Inhibits solder fatigue due to thermal shock

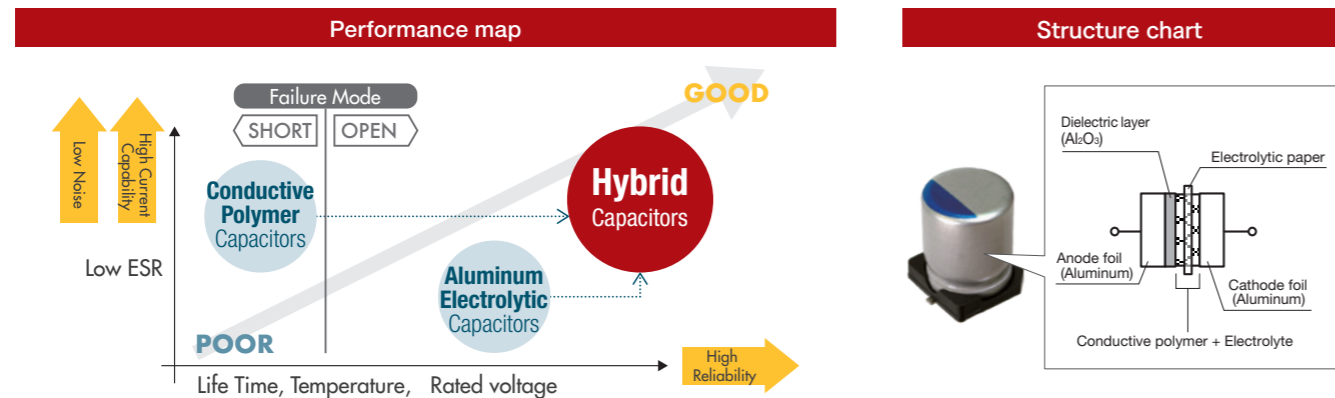


## Aluminum Electrolytic Capacitors

Powertrain/Safety Body & Chassis/Infotainment

# Conductive Polymer Hybrid Aluminum Electrolytic Capacitors

Realizing a low ESR, long life, and low leak current with a hybrid structure (electrolyte + conductive polymer)



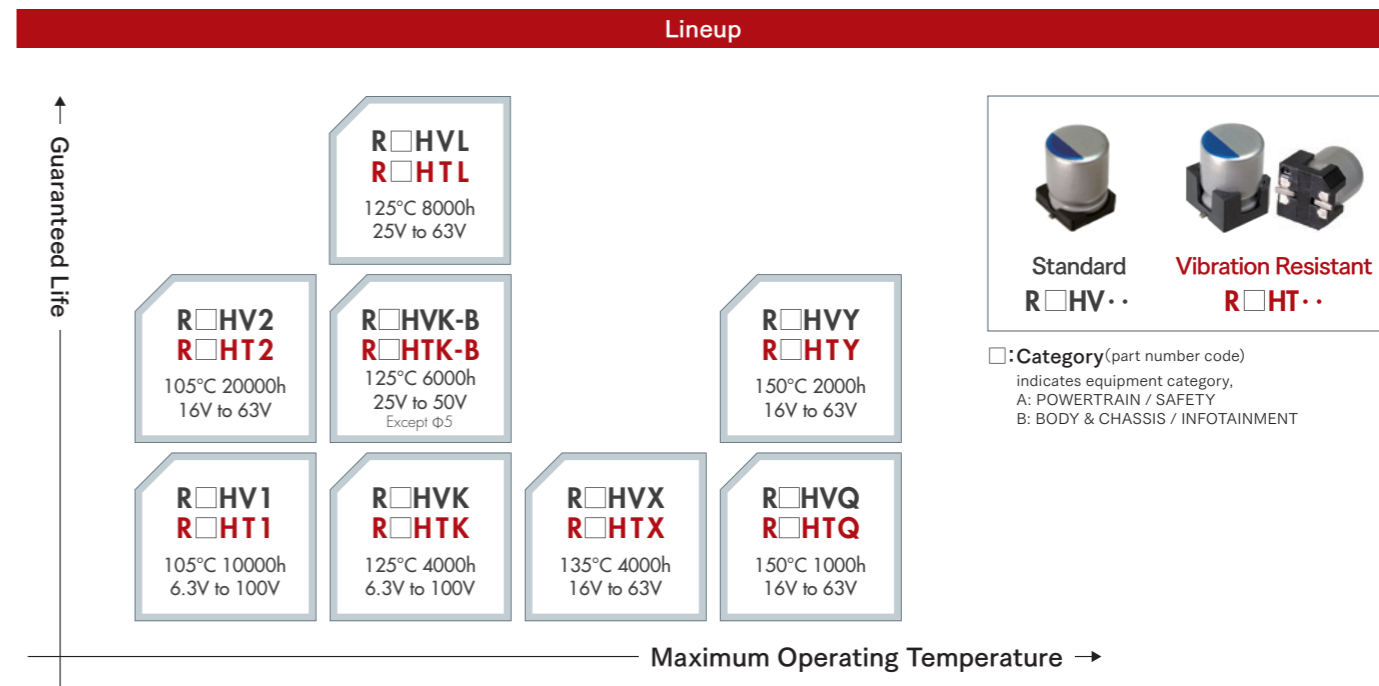
### Characteristics comparison

Item	Aluminum Electrolytic Capacitors	Conductive Polymer Hybrid Aluminum Electrolytic Capacitors
Electrolyte	electrolytic solution	Conductive Polymer + electrolytic solution
ESR @20°C 100kHz	Average	<b>Excellent</b>
Leakage current	Good	<b>Excellent</b>
Rated ripple current	Average	Good
High Freq. Characteristics at low temperature	Average	<b>Excellent</b>
Guaranteed life	Average	<b>Excellent</b>

## Featured Products

Powertrain/Safety Body & Chassis/Infotainment

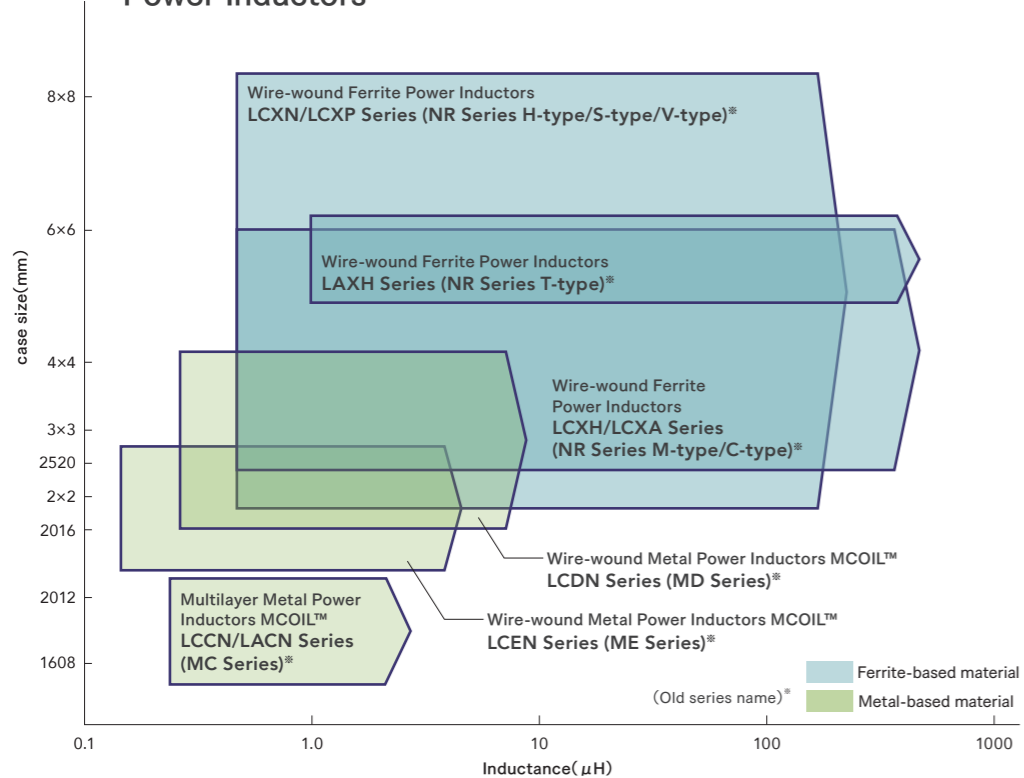
### Conductive Polymer Hybrid Aluminum Electrolytic Capacitors



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# Inductors

## Power Inductors

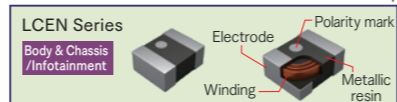


\*MCOIL™ is a registered trademark or a trademark of TAIYO YUDEN CO., LTD. in Japan and other countries.  
 \*The characters before "Series" are extracted from the product number and used for representing the classification (e.g., type, characteristics) of the product.

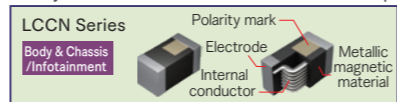
Wire-wound Metal Power Inductors MCOIL™ (125°C compatible)



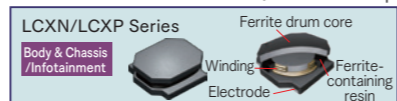
Wire-wound Metal Power Inductors MCOIL™ (125°C/150°C compatible)



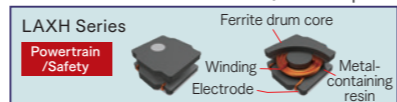
Multilayer Metal Power Inductors MCOIL™ (150°C compatible)



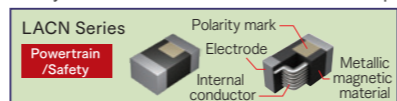
Wire-wound Ferrite Power Inductors (125°C/150°C compatible)



Wire-wound Ferrite Power Inductors (150°C compatible)



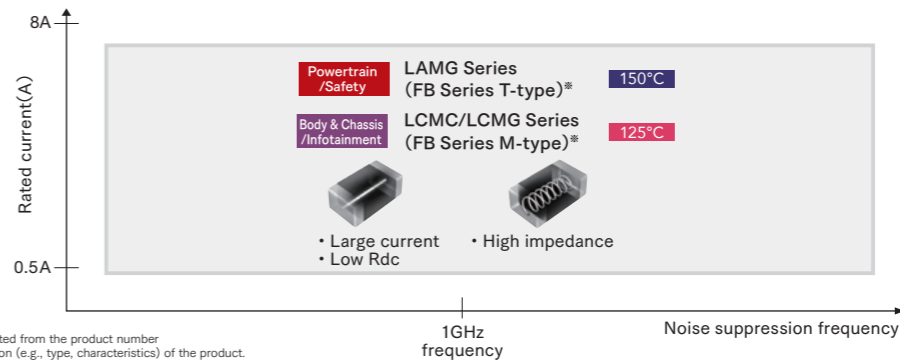
Multilayer Metal Power Inductors MCOIL™ (165°C compatible)



# EMC

## Ferrite Bead Inductors

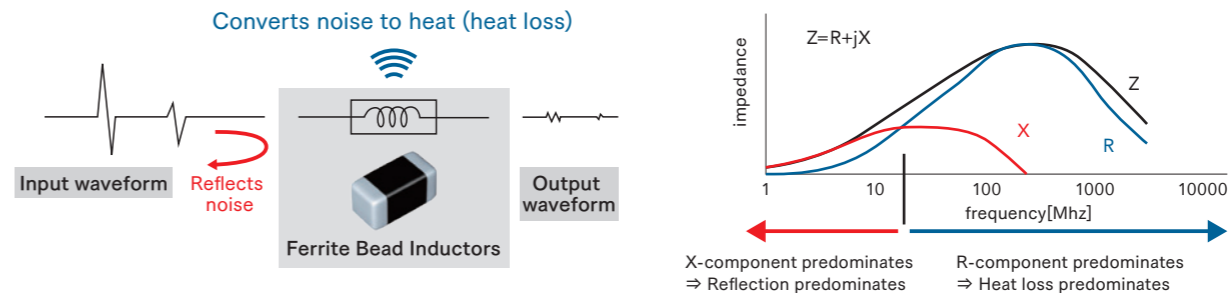
### Performance map



\*The characters before "Series" are extracted from the product number and used for representing the classification (e.g., type, characteristics) of the product.

(Old series name)\*

### Functions of ferrite bead inductors



# RF Devices

Body & Chassis/Infotainment

## Overview

• FBAR, SAW, and multilayer filters support a wide range of needs

## Advantages

- FBAR/SAW: Steep attenuation providing great frequency selectivity
- Multilayer Ceramic Filters: Suitable for high frequencies / wide bandwidths required for high-speed communication

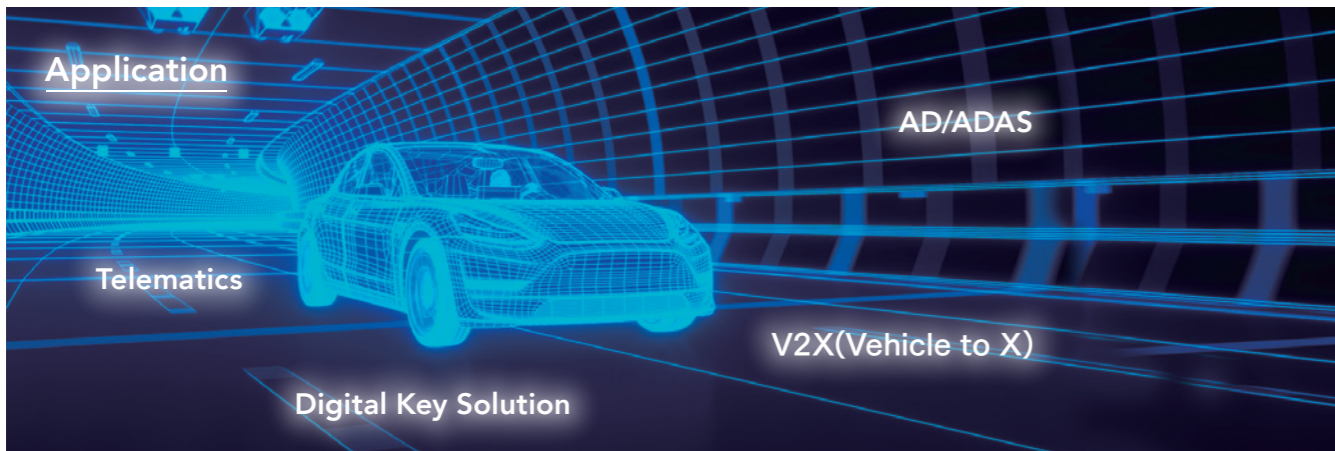
### FBAR/SAW Devices



### Multilayer Ceramic Devices



## Application

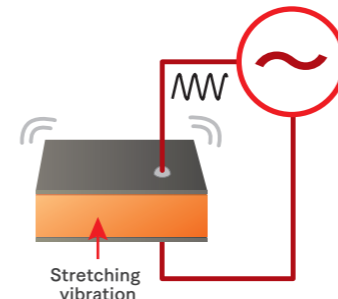


# Multilayer Piezoelectric Actuators

Body & Chassis/Infotainment

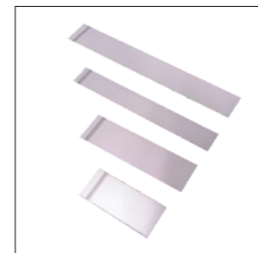
Functional Elements with High Displacement and Low Power Consumption

## Inverse Piezoelectric Effect



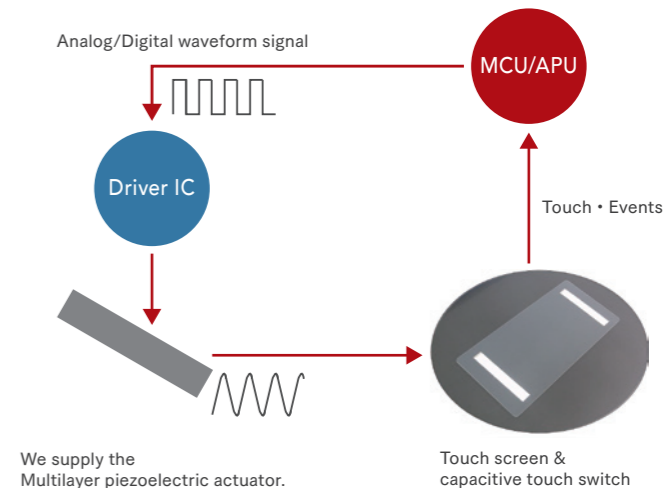
※ When an AC voltage is applied to a piezoelectric body, it is subject to a stretching vibration.

## Optimal shape proposals



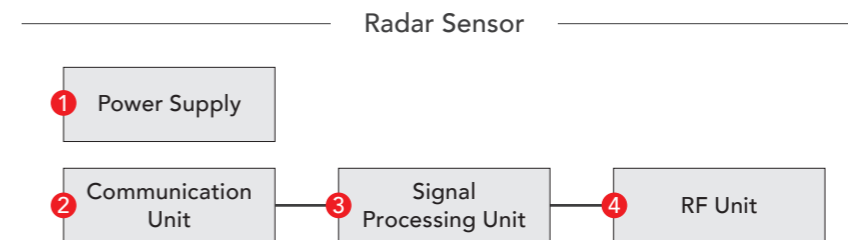
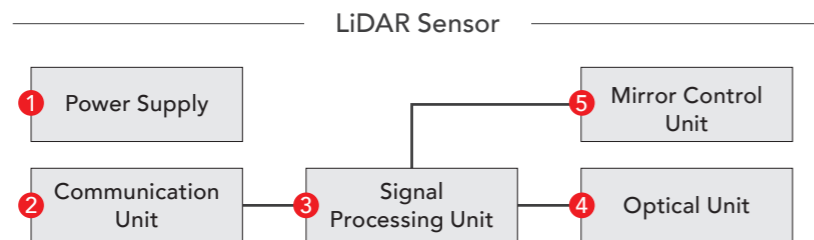
## Optimal circuit proposals

### 【Business model for Multilayer piezoelectric actuators】



Visit our website from the URL below or the QR code on the left for proposed solutions to multi-layer piezoelectric actuators.  
[https://www.yuden.co.jp/or/solutions/piezoelectric\\_actuator/index.html](https://www.yuden.co.jp/or/solutions/piezoelectric_actuator/index.html)

# Application Guides



No	Block	Category	Form Factor	Series
1	Power Supply	MLCC	Chip	Medium-High Voltage Multilayer Ceramic Capacitors for Automotive Body & Chassis and Infotainment Multilayer Ceramic Capacitors (High dielectric type) for Automotive Body & Chassis and Infotainment MCAS Series
		Power Inductor	SMD	Wire-wound Metal Power Inductors MCOIL™ LCDN(MD-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXN/LCXP(NRH-V,NRS-V,NRV-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXH(NRM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Bead Inductor	Chip	Wire-wound Ferrite Bead Inductors for Power Lines LCMC/LCMG (FBM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Hybrid AL-CAP	SMD	Low ESR Hybrid Polymer Chip:RCHV1(HV) <sup>®</sup> series,Low ESR, 125°C, Hybrid Polymer Chip:RCHVK(HVK) <sup>®</sup> series
2	Communication	Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		MLCC	Chip	Medium-High voltage Multilayer Ceramic Capacitors for Automotive Body & Chassis and Infotainment Multilayer Ceramic Capacitors(High dielectric type)for Automotive Body & Chassis and Infotainment MCAS Series
3	Signal Processing	Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
4	Optical	MLCC	Chip	LW Reversal Decoupling Low ESL Capacitors (LWDC™) for Automotive Body & Chassis and Infotainment MCRL Series
		Power Inductor	SMD	Wire-wound Ferrite Power Inductors LCXN/LCXP(NRH-V,NRS-V,NRV-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXH(NRM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
5	Mirror Control	Power Inductor	SMD	Wire-wound Ferrite Power Inductors LCXN/LCXP(NRH-V,NRS-V,NRV-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXH(NRM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment

No	Block	Category	Form Factor	Series
1	Power Supply	MLCC	Chip	Medium-High Voltage Multilayer Ceramic Capacitors for Automotive Body & Chassis and Infotainment Multilayer Ceramic Capacitors (High dielectric type) for Automotive Body & Chassis and Infotainment MCAS Series
		Power Inductor	SMD	Wire-wound Metal Power Inductors MCOIL™ LCDN(MD-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXN/LCXP(NRH-V,NRS-V,NRV-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXH(NRM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Bead Inductor	Chip	Wire-wound Ferrite Bead Inductors for Power Lines LCMC/LCMG (FBM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
		Hybrid AL-CAP	SMD	Low ESR Hybrid Polymer Chip:RCHV1(HV) <sup>®</sup> series,Low ESR, 125°C, Hybrid Polymer Chip:RCHVK(HVK) <sup>®</sup> series
2	Communication	Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
3	Signal Processing	Power Inductor	Chip	Multilayer Metal Power Inductors MCOIL™ LCCN(MC-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Metal Power Inductors MCOIL™ LCEN (ME-KV) <sup>®</sup> series for Automotive Body & Chassis and Infotainment
4	RF	MLCC	Chip	High frequency/Low loss Medium-High Voltage Multilayer Ceramic Capacitors for Automotive Body & Chassis and Infotainment MCAR series
		Power Inductor	SMD	Wire-wound Ferrite Power Inductors LCXN/LCXP(NRH-V,NRS-V,NRV-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment Wire-wound Ferrite Power Inductors LCXH(NRM-V) <sup>®</sup> series for Automotive Body & Chassis and Infotainment

(Old series name)<sup>®</sup>

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※ "MCOIL" is a registered trademark or a trademark of TAIYO YUDEN CO., LTD. in Japan and other countries.

※ The characters before "Series" are extracted from the product number and used for representing the classification (e.g., type, characteristics) of the product.



Visit our website from the URL below or the QR code on the left for the introduction of various examples of applications.

<https://www.yuden.co.jp/or/product/application/>

## About part numbers

TAIYO YUDEN has implemented changes to the part numbers of our products.

By changing the part numbers, we will be able to clarify the target market and equipment in which our products are used, and recommend our customers appropriate products for their intended purposes as possible. In addition, in making the changes, we have established new common rules that will make it easier for our customers to understand and search for part numbers and recommended applications of our products.

Part Numbering System				Set the Numbers for Each Product															
Common Rules																			
Digit	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑳
Part Number	Product Group	Category	Type	Features Characteristics															

**① Product Group:** Indicates the product group, such as multilayer ceramic capacitors and inductors.  
**② Category:** Indicates the recommended applications, such as automotive electronic equipment, industrial equipment, and general electronic equipment for consumer.  
**③ Type:** Indicates the product type, such as the shape and functions of each product.  
**④ Features・Characteristics:** Indicates the features and characteristics for each product.  
**⑤~⑳ :** Indicates the specifications, internal code, etc. for each product.

## About Product Series

Application	Product Series		Quality Grade <sup>※3</sup>
	Equipment <sup>※1</sup>	Category (Part Number Code) <sup>※2</sup>	
Automotive	Automotive Electronic Equipment(POWERTRAIN, SAFETY)	A	1
	Automotive Electronic Equipment(BODY & CHASSIS, INFOTAINMENT)	C	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	B	2
Medical	Medical Devices classified as GHTF Class C(Japan Class III)	M	2
	Medical Devices classified as GHTF Classes A or B(Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3
	Only for Mobile Devices*4	E	4

※1 Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.

※2 On each of our part number, the 2nd code from the left is a code indicating the "Category" as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.

※3 Each product series is assigned a "Quality Grade" from 1 to 4 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

※4 The applications covered by this product series are limited to mobile devices (smartphone, tablet PC, smartwatch, handheld game console, etc.) among general electronic equipment for consumer. The design, specifications and operating environment, etc. differ from those of the product series for "General Electronic Equipment" (Category: S), so please check the individual product specification sheets for details. The product series for "General Electronic Equipment" (Category: S) can also be used for mobile devices.

## IATF16949 Certification Status

※Contact the sales representative for the latest information.

As of September 2024

Site	Location	Products
TAIYO YUDEN CO., LTD. Tamamura Plant	Japan	Multilayer Ceramic Capacitors
TAIYO YUDEN CO., LTD. Haruna Plant	Japan	Ceramic Powder
TAIYO YUDEN CO., LTD. Nakanojo Plant	Japan	Core, Powder for the Inductors
TAIYO YUDEN CO., LTD. Tamamura Plant	Japan	Multilayer Ceramic Devices
NIIGATA TAIYO YUDEN CO., LTD.	Japan	Multilayer Ceramic Capacitors
TAIYO YUDEN CHEMICAL TECHNOLOGY CO., LTD.	Japan	Plating for Terminal electrode
FUKUSHIMA TAIYO YUDEN CO., LTD.	Japan	Ferrite Wire-wound SMD Power Inductors, Metal Wire-wound Chip Power Inductors
WAKAYAMA TAIYO YUDEN CO., LTD.	Japan	Multilayer Chip Inductors
TAIYO YUDEN Mobile Technology Co., Ltd.	Japan	SAW devices, FBAR devices
KOREA KYONG NAM TAIYO YUDEN CO., LTD.	Korea	Multilayer Ceramic Capacitors
TAIYO YUDEN (SARAWAK) SDN. BHD.	Malaysia(Sarawak)	Multilayer Ceramic Capacitors
TAIYO YUDEN (GUANGDONG) CO., LTD.	China(Guangdong)	Multilayer Ceramic Capacitors, SMD Power Inductors, Ring Varistors
TAIYO YUDEN (PHILIPPINES), INC.	Philippines(Cebu)	Multilayer Chip Inductors, Rectangular Wire Wound Ferrite Chip Inductors Low Profile Wire Wound Ferrite Inductors, Wire Wound Chip Inductors Metal Core SMD Power Inductors
ELNA CO., LTD. Aomori Factory	Japan	Aluminum electrolytic capacitors with solid and non-solid electrolyte Electric double layer capacitors
ELNA CO., LTD. Shirakawa Factory	Japan	Conductive polymer hybrid Aluminium electrolytic capacitors
ELNA (THAILAND) CO., LTD.	Thailand(Chiangmai)	Aluminum electrolytic capacitors, Electric double layer capacitors
ELNA (MALAYSIA) SDN. BHD.	Malaysia(Penang)	Aluminum electrolytic capacitors